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(54) **MANUAL BUNDLING TOOL**

MANUELLES BÜNDELUNGSWERKZEUG

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Description

Technical Field

[0001] The present invention relates to a manual binding tool for a binding band, and more particularly to a manual binding tool which is suitably used for a binding work using a metal-made binding band (metal tie).

Background Art

[0002] As a manual binding tool of this kind, a tool disclosed in Patent Literature 1 is known. The manual binding tool is configured by including: a tightening mechanism (c) which pulls a band portion (a) with respect to a head portion (b); a first lever (1) and second lever (2) for manipulating the tightening mechanism (c); a cutting mechanism (e) which cuts an extra band portion (a) after tightening; and a third lever (3) for manipulating the cutting mechanism (e). EP 0479623 A also discloses such a manual binding tool.

[0003] In binding manipulation by the manual binding tool, as shown in Figs. 14 and 15 of Patent Literature 1, a binding band which is wound around a to-be-bound object such as a wire harness is tightened by gripping manipulation on the first lever (1) and the second lever (2). When the gripping manipulation is repeated and the tightening force reaches a predetermined value, the second lever (2) is swung in a buckling manner, and tightening is disabled. When tightening is disabled, the fingers which are engaged with the second lever (2) are transferred to grip the third lever (3), and the cutting mechanism (e) is operated by gripping manipulation on the first lever (1) and the third lever (3) to cut away an unwanted band portion, thereby ending a series of binding works.

[0004] Namely, the tool has the configuration in which the tightening mechanism is operated by gripping the first lever and the second lever, and the cutting mechanism is operated by gripping the first lever and the third lever. Therefore, the tightening and cutting operations of the binding band can be performed by single-hand manipulation including the finger engagement transfer between the first lever and the third lever, and the tool is convenient and easy to use. The tool is excellent because it enables a binding work to be performed in a state where one arm is stretched, in a high place such as a power transmission line.

Prior Art Literature

Patent Literature

[0005] Patent Literature 1: Japanese Patent Application Laid-Open No. 2009-262965

Summary of the Invention

Problems to be Solved by the Invention

[0006] According to the situation where simple and convenient execution of the tightening and cutting of a binding band with one hand is usual and accustomed because of the realization of the manual binding tool, however, the finger engagement transfer becomes troublesome and bothersome. In transition to the cutting manipulation after ending of the tightening manipulation, namely, the operation of transferring a plurality of fingers from the second lever to the third lever is gradually hardly performed.

[0007] In the case where the manual binding tool is gripped by the hand, usually, a state where the four fingers other than the thumb are engaged with the second lever is produced. When the tightening manipulation is to be shifted to the cutting manipulation, therefore, the four fingers or the index finger, the middle finger, the fourth finger, and the little finger are transferred to be engaged with the third lever. When all the four fingers are moved together at once, it is impossible to grip the tool. Therefore, the fingers are obliged to be sequentially transferred. The series of transferring operations are particularly hardly performed.

[0008] In a use condition in which the user is relatively easily tired, such as that in which one hand is raised in a high place such as an iron tower, for example, the transferring of plural fingers imposes burden, and a break must be frequently taken, with the result that continuous binding works are hardly performed and works easily become unreasonable. During the transferring of plural fingers, moreover, the one-hand gripping of the tool by fingers is easily unstabilized, thereby causing another problem that the above-described trouble and botheration are increased. It seems to be undeniable that the emergence of a manual binding tool which can be manipulated by one hand causes work contents to be sophisticated and complicated, with the result that the manipulation of transferring fingers is gradually felt to be difficult.

[0009] It is an object of the invention to provide a manual binding tool in which, because of further improvement of the structure in view of the above-discussed circumstances, without performing transferring a plurality of fingers, tightening manipulation and cutting manipulation can be performed simply by performing gripping manipulation of a pair of levers, so that the tool can further simplify a binding work, and is very easy to use.

Means for Solving the Problem

[0010] The invention provides a manual binding tool according to claim 1.

[0011] The invention of claim 2 is characterized in that, in the manual binding tool of claim 1, a tightening adjusting mechanism f which can change setting of a maximum value of a pulling force caused by the tightening mech-

anism a is disposed.

Effects of the Invention

[0012] According to the invention, the switching mechanism performs switching so that, when the pulling force of the projection tie portion is smaller than the preset value, the tightening state where the tightening mechanism is caused to operate is set, and, when the pulling force of the projection tie portion reaches the preset value, a cutting state where the pushing mechanism is caused to operate is set. Without disposing a third lever, therefore, tightening manipulation and cutting manipulation can be performed on the binding tie, by performing gripping manipulation of only the pair of levers.

[0013] In both tightening and cutting steps, therefore, the state where the first and second levers are gripped can be maintained, and consequently the prior art bothersome problem in that, in the case where the tightening manipulation is to be shifted to the cutting manipulation, a plurality of fingers are transferred from the second lever to the third lever can be solved.

[0014] As a result, it is possible to provide a manual binding tool in which, without performing transferring of a plurality of fingers, tightening manipulation and cutting manipulation can be performed simply by performing gripping manipulation of the pair of levers, so that the tool can further simplify a binding work, and is very easy to use.

[0015] According to the invention, the tool includes the pushing mechanism, the tie portion can be pushed and deformed, and the deformed portion can be engaged into the hole of the tie portion onto which the head portion is previously fitted. Therefore, the tool can be used also for a binding tie having a structure which is not provided with a self-engaging function (a structure in which punch engagement is performed), such as a metal tie. Consequently, an advantage that the tool has high versatility is added.

[0016] According to the invention, when the projection tie portion is not gripped by the pulling portion, return movement of the projection tie portion to the head portion is blocked by the return preventing mechanism. During a period when the projection tie portion is not pulled, such as a return swinging step, therefore, a possibility that the tie portion return moves is eliminated. As a result, bothersome manipulation in which the first and second levers are quickly gripped so that the tie portion is not returned is not necessary, and there is another advantage that a binding work can be performed easily and smoothly.

[0017] According to the invention of claim 2, the setting of the maximum value of the pulling force of the tie portion 4 can be changed by the tightening adjusting mechanism, and the tightening force can be adjusted. Therefore, it is possible to provide a manual binding tool in which, for example, the tightening force due to the binding tie can be easily adjusted and set in accordance with a to-be-bound object, and which is therefore highly easy to use and practically advantageous.

Brief Description of the Drawings

[0018]

[Fig. 1] Fig. 1 shows a manual binding tool of Embodiment 1, (a) is a perspective view, and (b) is a front view.
[Fig. 2] Fig. 2 shows the manual binding tool of Fig. 1, (a) is a rear view, and (b) is a left side view.
[Fig. 3] Fig. 3 is a front view showing the internal structure of the manual binding tool of Fig. 1.
[Fig. 4] Fig. 4 is an exploded perspective view showing the structure of the manual binding tool of Fig. 1.
[Fig. 5] Fig. 5 shows an example of the use condition (waiting state) of the manual binding tool, (a) is a perspective view as viewed from the side of a to-be-bound article, and (b) is a partially cutaway front view including the internal structure.
[Fig. 6] Fig. 6 shows a metal-made binding tie, (a) is an overall view in a free state, and (b) is a rear view in the vicinity of a head portion.
[Fig. 7] Fig. 7 shows the structure of the vicinity of the head portion of the binding tie of Fig. 6, (a) is a longitudinal sectional view, and (b) is a transverse sectional view.
[Fig. 8] Fig. 8 is a functional view showing a tightening step of pulling a projection tie portion.
[Fig. 9] Fig. 9 is a functional view showing a state where, in the tightening step, a second lever is maximally swung to be located at a second position.
[Fig. 10] Fig. 10 is an enlarged front view showing main portions of the manual binding tool shown in Fig. 9.
[Fig. 11] Fig. 11 is a functional view of main portions showing a state where the tightening force reaches a preset value, an engagement between a triangular link and a tension arm is cancelled, and the tightening step is being transferred to a punch cutting step.
[Fig. 12] Fig. 12 is a functional view showing a state where, in the punch cutting step, the second lever is maximally swung to be located at a third position.
[Fig. 13] Fig. 13 is an enlarged view of main portions showing an operation state in the punch cutting step.
[Fig. 14] Fig. 14 is an enlarged front view showing main portions of a tool body in Fig. 3.

Mode for Carrying Out the Invention

[0019] Hereinafter, an embodiment of the manual binding tool of the invention will be described with reference to the drawings. In the application, a manner of fixing a tie portion 4 by means of punch engagement may be expressed as "punch lock type".

[Embodiment 1]

[0020] As shown in Figs. 1 to 4, a manual binding tool A of Embodiment 1 is configured by including: a tool body 3 which has a cutting mechanism c and a tie holding portion g in a tip end portion, and a first lever 1 in a basal end portion; a second lever 2 which is pivotally supported on the tool body 3 about an axis P; a tightening mechanism a; a tightening linkage mechanism b; a cutting linkage mechanism d; a switching mechanism e; a tightening adjusting mechanism f; and the like. The tightening mechanism a, the tightening linkage mechanism b, the cutting linkage mechanism d, and the switching mechanism e are mainly disposed in the tool body 3, and the tightening adjusting mechanism f is mainly disposed in the first lever 1. The cutting mechanism c has a configuration including a pushing mechanism h.

[0021] Initially, a binding work performed by the manual binding tool A will be briefly described. As shown in Fig. 5, first, a projection tie portion 4a of a binding tie B which is wound around a to-be-bound object K to be temporarily fixed thereto is inserted into a tie passage hole 6 (see Fig. 4) of the tool body 3 at a degree in which the tip end is passed therethrough, and a head portion 5 is inserted into the tie holding portion g.

[0022] As shown in Figs. 3 and 9, then, the first lever 1 and the second lever 2 are relatively approaching swung until the second lever 2 is moved from a first position t1 to a second position t2, and gripping manipulation in which the projection tie portion 4a is forcibly pulled with respect to the head portion 5 held by the tie holding portion g, by actuation of the tightening mechanism a, and a grip releasing manipulation are performed.

[0023] When the gripping manipulation and the grip releasing manipulation are performed one time or a plurality of times, thereby causing the tightening force to reach a predetermined value, the movement of the second lever 2 from the second position t2 to a third position is allowed by subsequent gripping manipulation.

[0024] As a result of the swinging of the second lever 2 from the second position t2 to the third position t3, the pushing mechanism h and the cutting mechanism c operate (see Figs. 12 and 13), the tie portion 4 is engaged with the head portion 5, and the projection tie portion 4a is cut in a place proximity to the head portion 5.

[0025] As shown in Figs. 6 and 7, the binding tie (binding band) B which is used in the manual binding tool A of Embodiment 1 is a separation type metal tie in which the head portion 5 that is made of a metal such as a stainless steel plate is incorporated in the long band-like tie portion 4 that is made of a metal such as a stainless steel plate.

[0026] The tie portion 4 is configured by a steel plate band which is small in thickness and in width, and has: a pointed tip end 7 configured by a long inclined edge 7a and a short inclined edge 7b; a pair of holes 7c which are in the vicinity of the pointed tip end, and which have an inclined rounded-corner rectangular shape; a cut and raised claw 8 which is on the root side; a stopper 9 which is mostly on the root side; and an engagement hole 10.

[0027] The head portion 5 has a flat and substantially C-like shape which is formed by bending a steel plate which is thicker than the tie portion 4, and has: a passage path 5a through which the tie portion 4 is to be passed; an escaping hole 5b on the rear side (the side of the to-be-bound object); a substantially circular cutaway 5c which is on the front side, and which is used for passing a punch; and the like. The width in the thickness direction of the passage path 5a is set to a dimension which allows two tie portions 4 in a stacked state to be passed therethrough without forming a substantial gap.

[0028] The head portion 5 is inserted from the pointed tip end 7 into the tie portion 4, passed over the cut and raised claw 8 while elastically deforming it, and engagedly disposed at a position between the cut and raised claw 8 and the stopper 9. The binding tie B in which the head portion 5 is disposed on the tie portion 4 is configured so as to enable a state where, as shown in Fig. 7, the escaping hole 5b, the engagement hole 10, and the substantially circular cutaway 5c are aligned (stacked) in a straight line.

[0029] Next, the manual binding tool A will be described. As shown in Figs. 1 to 4, 10, and 14, the manual binding tool A is configured by having: the tool body 3 which integrally includes the first lever 1; the second lever 2 which is pivotally supported about the axis P on the tool body 3; a base arm 11 which is pivotally coupled to the tool body 3 about the axis P; and the like.

[0030] In the tool body 3, a tension arm 12 which is movable swingly about a fulcrum X, a triangular link 13 which is usually swingable while setting the axis P as a virtual center, the cutting mechanism c, a chuck claw 15 which is swingable about a fulcrum Y, a return spring 16 for the base arm 11, and the like are disposed.

[0031] The first lever 1 which is a projection portion of the tool body 3 is provided with the tightening adjusting mechanism f configured by an adjustment knob 17 which can be rotated, a tightening force adjusting spring 18, a spring receiver 19 for the tightening force adjusting spring 18, and the like. A tension bar 20 which is pivotally coupled to both the tension arm 12 and the spring receiver 19 is disposed.

[0032] The base arm 11 is provided with an engagement claw 21 which is swingable about a fulcrum Z, a return spring 22 which tries to return the engagement claw 21 to a waiting state, a spring receiver 23 which is pivotally coupled to be used for the return spring 16, and the like. The second lever 2 is covered with a grip 24 which is made of a synthetic resin or the like, a cutter roller 25 is supported at the tip end, and a linear engagement groove 26 is formed on the side of the tip end. The engagement groove 26 is placed and set in a state where the groove is inclined so that the closer to the tip end side (on the side of the tie holding portion g), the larger the diameter related to the axis P.

[0033] The tightening adjusting mechanism f functions

in the following manner. When the adjustment knob 17 which is rotatably supported by the first lever 1 is rotated to the left and fastened, a square nut 35 screwed to a knob shaft 17a is moved to the left side in Fig. 3 (to the side of the axis P), and the tightening force adjusting spring 18 which is between the nut and the spring receiver 19 is compressed to increase the elastic force. This causes the force by which the tension arm 12 pressingly urges the triangular link 13, to be increased, and a setting tightening force is adjusted in the increasing direction.

[0034] When the adjustment knob 17 is rotated to the right and loosened, conversely, the square nut 35 is moved to the right side in Fig. 3 (to the side of the adjustment knob 17) to separate from the spring receiver 19, and the tightening force adjusting spring 18 expands to weaken the elastic force. Therefore, the force by which the tension arm 12 pressingly urges the triangular link 13 is reduced, and the setting tightening force is adjusted in the decreasing direction.

[0035] The cutting mechanism c is configured by: a holder 30 which is housed and supported in a cutter body 14 so as to be extractively and retractively slidable; a cutting blade 27 which is integrally supported by the holder 30, and which is extractively and retractively slidable; a punch body 28 which is inserted into the cutting blade 27 to be integrally supported thereby; a return spring 29 for returning the cutting blade 27 to a waiting position; and the like. In a usual state where the cutter roller 25 does not push the holder 30, the return spring 29 causes the cutting blade 27 and the punch body 28 to be in a retracted waiting position (see Fig. 14).

[0036] Although described in detail later, the punch body 28 is used for pushing the tie portion 4 to be engaged with the tie portion 4 which is in the inner side, and the head portion 5 by means of plastic deformation, and cooperates with a pin 34 (described later) and the like to constitute the pushing mechanism h.

[0037] As shown in Figs. 3, 4, and 14, the cutter body 14 is configured by a lower body 14A and an upper body 14B which is placed above the lower body, and the cutting mechanism c is housed and configured between the both bodies 14A, 14B. The return spring 29 is inserted and placed between an upper projection 14a of the lower body 14A and a holder back wall 30a.

[0038] In the cutting blade 27, its root portion is placed between a pair of right and left front sidewalls 30b, 30b of the holder 30. The cutting blade is integrated together with the punch body 28 which is housed in a passing hole (not denoted by a reference numeral) of the blade, with the holder 30 by the pin 34 that is passed therethrough.

[0039] During a normal period (the period other than "punch cutting step" which will be described later) when the cutting mechanism c is not manipulated by the second lever 2, the cutting mechanism c is return-urged by the elastic force of the return spring 29 to a waiting state where a front wall 30c of the holder 30 butts against the upper projection 14a, and a blade portion 27a and a pointed punch portion 28a are separated from the binding tie B that is held by the tie holding portion g. The tip end of the punch portion 28a may have a pointed angle shape or a slightly rounded shape (see Fig. 13).

[0040] The chuck claw 15 which is pivotally supported at the fulcrum Y by the lower body 14A is elastically urged in a state where a gear-toothed chuck portion 15a butts against a guide wall 6a of the tie passage hole 6, by a torsion coil spring 32 (see Fig. 4) disposed about the fulcrum Y.

[0041] The tool is configured in a state where the second lever 2 having a pair of right and left sidewall portions 2a, 2a is placed inside the base arm 11 having a pair of right and left plate members, the triangular link 13 is placed between the sidewall portions 2a, 2a, and the tension arm 12 is located between a pair of right and left plate portions 13A, 13A constituting the triangular link 13.

[0042] In the triangular link 13 configured by the pair of right and left plate members, its tip end portion is pivotally supported by a long hole 21a of the engagement claw 21 through a tip-end pin 13a, a root pin 13b is supported in a root portion, and a support roller 31 which is fitted onto the root pin 13b is engaged in an arcuate tip-end recess 12a of the tension arm 12.

[0043] An intermediate pin 13c is supported in an intermediate portion of the triangular link 13, and passed through and engaged with the engagement groove 26 so as to be relatively rotatable and movably in the longitudinal direction of the groove.

[0044] The tension arm 12 is elastically urged in a state where the arm is swung about the fulcrum X toward the tie holding portion g by the tightening force adjusting spring 18 of the tightening adjusting mechanism f, whereby, in the usual state (the waiting state where the second lever 2 is in the first position t1), the tip-end pin 13a is positioned in the end of the long hole 21a on the side of the tie holding portion g, and the intermediate pin 13c is positioned in the end of the engagement groove 26 on the side of the tie holding portion g. Because of the positional relationship of the tip-end and intermediate pins 13a, 13c, the root pin 13b is placed approximately coaxially with the axis P.

[0045] As shown in Figs. 1, 2, 5, 11, and 13, the tie holding portion g is configured so as to be able to receive and hold the head portion 5, by fitting right and left arcuate portions 5d, 5d of the head portion 5, between substantially semicircular inner circumferential portions of a pair of right and left hook portions 36, 36 at the tip end of the upper body 14B. A restriction projection 37 which is formed on an upper surface portion of the tip end of the lower body 14A is located immediately below the hook portions 36, 36. A structure is formed in which the end edge of the head portion 5 butts against the restriction projection 37 to function as a stopper for a co-movement of the head portion 5 due to the operation of pulling the projection tie portion 4a, and the head portion is not further pulled in and is positioned therein.

[0046] The dimensions are set so that, in the positioned state, as shown in Fig. 13, the escaping hole 5b and

substantially circular cutaway 5c of the head portion 5, the engagement hole 10 of the tie portion 4, and the punch portion 28a are coaxial with each other.

[0047] As shown in Fig. 4, the tool body 3 is configured by a left body case 3A and a right body case 3B, and the first lever 1 is configured by their basal end portions (not denoted by a reference numeral). The reference numeral 38 denotes a pair of right and left stepped circular support shafts which are flat. Each of the support shafts is configured by a small-diameter portion 38a which supports the base arm 11 and the second lever 2, and a flange portion 38b which is fitted in and supported by the corresponding one of the left and right left body cases 3A, 3B.

[0048] Next, the manner of the binding work in which the binding tie B is used by the manual binding tool A will be described. As shown in Fig. 5 and the like, first, a manual attaching step is performed in which the binding tie B is wound around the to-be-bound object K such as three wire harnesses by manual manipulation using the fingers, and the tie portion 4 is passed from the pointed tip end 7 through the head portion 5, and slightly pulled to be temporarily fixed thereto.

[0049] The manipulation of inserting the projection tie portion 4a which projects through the head portion 5 in the tie portion 4, into the tie passage hole 6 formed in the tool body 3 is performed to cause a state where, as shown in Fig. 5(b), the pointed tip end 7 projects to the outside of the tool through a passage path 11a in a tip end portion of the base arm 11.

[0050] Fig. 5(b) shows a state where the binding tie B is attached to the manual binding tool by the manual attaching step, and Fig. 3 shows only the manual binding tool in the state. Figs. 3 and 5 (b) show the waiting state where the gripping manipulation is not performed, i.e., a state where the second lever 2 is in the first position t1 which is the waiting position.

[0051] In the waiting state, a buttock portion 15b is pushed by a basal-end projection 21b of the engagement claw 21, the chuck claw 15 is forcibly swung against the elastic force of the torsion coil spring 32 (see Fig. 4), and the chuck portion 15a is clearly separated from the guide wall 6a by a distance which is larger than the thickness of the tie portion 4. Therefore, the chuck claw 15 is in a state where it exerts no action on the projection tie portion 4a (non-operation state in the return preventing mechanism j).

[0052] In addition, the engagement claw 21 is in a state where a gear-toothed tip end portion 21c is clearly separated from a tip-end inner wall 11b of the base arm 11 (see Fig. 10) by a distance which is larger than the thickness of the tie portion 4, by the elastic force of the return spring 22, and also the engagement claw 21 exerts no action on the projection tie portion 4a.

[0053] When the first lever 1 and the second lever 2 are then gripped by the fingers (not shown) of the right hand or the like, first, very small swinging of the second lever 2 with respect to the first lever 1 forms a state where the projection tie portion 4a is clamped and engaged between the tip end portion 21c of the engagement claw 21 and the tip-end inner wall 11b. From the waiting state shown in Figs. 3 and 14, namely, the triangular link 13 which is pushed through the intermediate pin 13c that is positioned in the end of the engagement groove 26 on the side of the tie holding portion g is very slightly swung substantially about the axis P by relative rotation of the root pin 13b and the support roller 31, and the tip-end pin 13a causes the engagement claw 21 to be forcibly swung about the fulcrum Z against the elastic force of the return spring 22.

[0054] Then, the tip end portion 21c of the engagement claw 21 pushes the tip-end inner wall 11b across the projection tie portion 4a, the second lever 2 and the base arm 11 are integrally swung about the axis P as shown in Fig. 8, and the engagement claw 21 exerts a self-lock function to forcibly pull and move the projection tie portion 4a gripped by the claw and the tip-end inner wall 11b, with respect to the head portion 5. As described above, the pulling portion i is configured by the tip end portion 21c and the tip-end inner wall 11b, i.e., by the engagement claw 21 and the base arm 11.

[0055] At this time, the chuck claw 15 is slightly pressed against the projection tie portion 4a by the torsion coil spring 32, and a state is formed in which the self-lock function of blocking a return movement of the projection tie portion 4a to the head portion 5 can be exerted. However, a movement in the direction along which the projection tie portion 4a further projects is allowed (see Figs. 8 and 9).

[0056] When the projection tie portion 4a is pulled, the tightening step is performed in which the length of the projection tie portion 4a wound around the to-be-bound object K is reduced, and the to-be-bound object K is tightened. Fig. 8 shows a state in the middle of gripping, i.e., the tightening step.

[0057] Then, the forced movement of the chuck claw 15 due to the pushing of the buttock portion 15b by the basal-end projection 21b of the engagement claw 21 is cancelled by the above-described very small swinging of the second lever 2 from the first position t1, and therefore the chuck claw 15 is projected and swung by the elastic force of the torsion coil spring 32 so that the chuck portion 15a is pressed and butted against the guide wall 6a.

[0058] This produces a state the projection tie portion 4a is clamped between the chuck portion 15a and the guide wall 6a. As described above, therefore, the self-lock function of the chuck claw 15 is produced, and the return movement to the head portion 5 is blocked. Namely, the return preventing mechanism j is configured by the lower body 14A having the guide wall 6a, and the chuck claw 15.

[0059] When the relatively approaching swinging of the second lever 2 toward the first lever 1 due to gripping is further conducted, the second lever reaches the second position t2 where the second lever cannot be further swung by gripping, as shown in Fig. 9, and the step of tightening the tie portion 4 by a single gripping operation

is ended.

[0060] Namely, the tightening step is performed in which the tightening linkage mechanism b and the tightening mechanism a are caused to operate by the relative swinging of the second lever 2 from the first position t1 to the second position t2, and the projection tie portion 4a is clamped and pulled by the engagement claw 21.

[0061] The second position t2 is a position which is determined by butting the thickness end surface 11c on the side of the basal end of the base arm 11 against large-diameter base portions 33a for a support shaft 33 having the fulcrum X of the tension arm 12 as shown in Figs. 9 and 10. Fig. 10 is a front view of main portions in Fig. 9.

[0062] When the tightening step is ended, and the gripping of the first and second levers 1, 2 by the fingers is released in the state shown in Fig. 9, the return swinging step is performed in which the base arm 11 and the second lever 2 are integrally return-swung by the elastic force of the return spring 16 acting on the basal end side of the base arm 11, and self-returns to the first position t1.

[0063] In the state where the second lever 2 is return-swung, the above-described self-lock function due to the chuck claw 15 is exerted, and the pulled projection tie portion 4a is engaged and held so as not to return move. Since the elastic force of the tightening force adjusting spring 18 does not substantially act on the triangular link 13, and that of the return spring 22 acts thereon, in addition, the clamping force which is produced by the engagement claw 21, and which is applied on the projection tie portion 4a vanishes, and only the second lever 2 and the base arm 11 are return-swung while the pulled projection tie portion 4a remains as is.

[0064] When the tightening force of the binding tie B, more specifically the pulling force of the projection tie portion 4a reaches a value which is previously set by the tightening adjusting mechanism f as a result of performing one time or a plurality of times a set of the tightening and return swinging steps that have been described, the process is automatically switched to the punch cutting step.

[0065] When the tightening force is the preset value, namely, the engagement between the support roller 31 and the tip-end recess 12a caused by the tightening adjusting mechanism f (tightening force adjusting spring 18) which determines the preset value cannot be maintained, and the engagement claw 21 and base arm 11 which exert the self-locking function cannot be further swung in the tie pulling direction. In accordance with further gripping of the second lever 2, therefore, the intermediate pin 13c is moved in the engagement groove 26 toward the first lever 1 as shown in Fig. 11, whereby the tension arm 12 which is pushed by the support roller 31 is retractively swung about the fulcrum X toward the first lever 1, and the support roller 31 is disengaged from the tip-end recess 12a and then moved.

[0066] While leaving as is the base arm 11 which cannot be further swung, thus, only the second lever 2 is further gripped and swung toward the first lever 1, and the cutter roller 25 located at the tip end of the second lever 2 which is swung beyond the second position t2 pushingly drives the holder 30.

[0067] As shown in Figs. 12 and 13, then, the holder 30, and the cutting blade 27 and punch body 28 which are integrated therewith are forcibly projected and moved against the elastic force of the return spring 29. In Figs. 11, 13, and the like, the cut and raised claw 8 and the stopper 9 are not shown for the sake of simplicity.

[0068] First, the punch portion 28a at the tip end of the punch body 28 is passed over the substantially circular cutaway 5c, and then pushes the tie portion 4 located in the head portion 5 to cause plastic deformation (press molding), thereby producing an engagement state where the plastically deformed portion 4b enters the engagement hole 10 and the escaping hole 5b [see Fig. 13(b)].

[0069] Moreover, the blade portion 27a at the tip end of the cutting blade 27 press cuts the projection tie portion 4a at a position proximity to the head portion 5.

[0070] At this time, the both sides of the projection tie portion 4a are supported by the head portion 5 and the guide wall 6a. The place which is in a so-called both-ends supported state is press cut by the blade portion 27a, and an extra projection tie portion 4a is cut away surely and smoothly.

[0071] As shown in Fig. 13(b), in a state where the cutting blade 27 is mostly projected, furthermore, the tie portion 4 which is located on the to-be-bound object side of the projection tie portion 4a is in a state where it is slightly pushed by the blade portion 27a which has been used for cutting.

[0072] However, the pushed tie portion 4 is in a so-called cantilever state due to the head portion 5, and a tendency to bend toward the to-be-bound object side is originally provided by a tip-end wall 11A. Therefore, the tie portion is pushed so slightly that it receives no action from the blade portion 27a.

[0073] Only when the force reaches the preset tightening force, as described above, the second lever 2 is allowed to be moved from the second position t2 to the third position t3. In the punch cutting step due to the movement to the third position t3, engagement of tie portions 4, and engagement (punch engagement) of the tie portion 4 and the head portion 5 are performed, and an extra projection tie portion 4a is cut away.

[0074] Since the state where the circular plastically deformed portion 4b is press inserted into the engagement hole 10 and the escaping hole 5b is obtained, because of the sure punch engagement, the prevention of slipping off of the tie portion 4 itself, and the integration of the tie portion and the head portion 5 are performed in one stroke, and the bundling state by the preset tightening force can be surely maintained.

[0075] After the projection tie portion 4a is cut, the restriction of the triangular link 13 by the engagement claw 21 is canceled. In accordance with return swinging of the second lever 2 to the first position t1, therefore, the tool is returned to the state (see Fig. 3) where the support

roller 31 is again engaged into the tip-end recess 12a, and the tightening adjusting mechanism f effectively functions.

[0076] In the manual binding tool A, as shown in Figs. 3, 4, 14, and the like, the tightening mechanism a is configured by having the base arm 11, the engagement claw 21, and the return spring 22. The tightening linkage mechanism b is configured by having the tension arm 12, the triangular link 13, and the engagement groove 26 which is fitted to the intermediate pin 13c.

[0077] The cutting linkage mechanism d is configured by having the cutter roller 25, the triangular link 13, the engagement groove 26, and the tension arm 12. The switching mechanism e is configured by having the tightening force adjusting spring 18, the tension bar 20, the tension arm 12, and the triangular link 13.

[0078] The tightening linkage mechanism b links the both levers 1, 2 with the tightening mechanism a in the state where the projection tie portion 4a is pulled by relatively approaching swinging in the range within the predetermined relative angle of the first lever 1 and the second lever 2, i.e., the angle between the first position t1 and the second position t2 about the axis P (the tightening step). The cutting linkage mechanism d links the both levers 1, 2 with the cutting mechanism c in the state where the projection tie portion 4a is cut by relatively approaching swinging of the first lever 1 and the second lever 2 in the predetermined angle, i.e., beyond the second position t2 (the punch cutting step).

[0079] Then, the switching mechanism e functions so as to, when the pulling force of the projection tie portion 4a due to the tightening mechanism a is smaller than the preset value, set the tightening state where the tightening linkage mechanism b is caused to operate, and the cutting linkage mechanism d is caused not to operate, and, when the pulling force of the projection tie portion 4a due to the tightening mechanism a reaches the preset value, cause the tightening linkage mechanism b not to operate, and the cutting linkage mechanism d to operate.

[0080] As shown in Figs. 14 and the like, the cutting mechanism c has the configuration including the pushing mechanism h which pushes and deforms the tie portion 4 that is located in the head portion 5 by being wound around the to-be-bound object K and then inserted into the head portion 5, by the punch body 28, and which causes the deformed portion (plastically deformed portion) 4b to be engaged into the circular engagement hole 10 formed in the tie portion 4 onto which the head portion 5 is previously fitted.

[0081] In Embodiment 1, a metal tie is used as the binding tie B, and therefore the cutting mechanism c is configured by including the pushing mechanism h. In the case where a binding tie configured so that the head portion includes a return preventing mechanism for the tie is used, a manual binding tool A including only the cutting mechanism c may be employed.

[0082] Because of the tightening mechanism a (specifically, because there is a play between a timing when the triangular link 13 and engagement claw 21 which include the fitting between the tip-end pin 13a and the long hole 21a are pushed by the second lever 2, and that when the tip end portion 21c starts to push the tip-end inner wall 11b through the projection tie portion 4a), the tool is configured in the state where, in accordance with movement in which the first lever 1 and the second lever 2 are relatively approaching swung by griping the both levers 1, 2 from the waiting state (state shown in Fig. 3) where the both levers 1, 2 are mostly openly swung, the projection tie portion 4a is gripped by the pulling portion i and then pulled by the pulling portion i.

[0083] When the projection tie portion 4a is not gripped by the pulling portion i (at least in the return swinging step), in addition, the return preventing mechanism j functions so as to block a return movement of the projection tie portion 4a to the head portion 5. Therefore, the tool is configured so that, just at the moment when the force applied by the fingers is released and the gripping of the first and second levers 1, 2 is cancelled, the return preventing mechanism j operates, and hence an unexpected return movement of the tightened tie portion 4 does not occur.

[0084] As described above, according to the manual binding tool A of Embodiment 1, by the switching mechanism e, when the pulling force of the projection tie portion 4a is smaller than the preset value, the tightening state where only the tightening mechanism a is caused to operate is set, and, when the pulling force of the projection tie portion 4a reaches the preset value, the tool is automatically switched to the punch cutting state where only the pushing mechanism h and the cutting mechanism c are caused to operate. Without disposing a third lever, therefore, the tool is configured so that the series of works (tightening and punch cutting) on the binding tie B can be performed simply by performing gripping manipulation of the pair of levers 1, 2.

[0085] Even in either of the tightening and cutting steps, therefore, the state where the first and second levers 1, 2 are gripped can be maintained, and the problem of the prior art manual binding tool in that, in the case where the tightening manipulation is to be shifted to the cutting manipulation, a plurality of fingers are transferred from the second lever to the third lever can be solved.

[0086] Therefore, it is possible to provide the manual binding tool A in which, without transferring a plurality of fingers, pulling manipulation and cutting manipulation can be performed simply by performing gripping manipulation of the pair of levers, so that the tool can further simplify a binding work, and is very easy to use.

[0087] In Embodiment 1, in addition, the punch body 28 is detachably integrated with the cutting blade 27. Therefore, the tool can be made suitable for the binding tie B (see Figs. 6 and 7) having the structure in which the tie portion 4 is deformed and inserted into the engagement hole 10 to be engaged therewith, or which is not provided with a so-called self-engaging function (a structure in which punch engagement is performed). When

the punch body 28 is detached, the tool can be used for a binding tie having a structure which is not provided with the punch engagement. Therefore, the tool has further advantages that it is high in versatility so as to suitable for various bonding ties, and easy to use and convenient.

[0088] Moreover, the return preventing mechanism j which, when the projection tie portion 4a is not gripped by the pulling portion i, such as when the second lever 2 is openly swung from the second position t2 to the first position t1, blocks a return movement of the projection tie portion 4a to the head portion 5 is disposed. Therefore, a possibility that an unexpected situation occurs that the tie portion 4 return moves when the projection tie portion 4a is not pulled, such as in the return swinging step is eliminated. Therefore, a bothersome manipulation in which the first and second lever 1, 2 are quickly gripped so that the tie portion 4 is not returned is no longer required, and hence a binding work can be performed easily and smoothly by the fingers.

[0089] Furthermore, the conditions for operating the switching mechanism e, i.e., the tightening force can be adjusted by a simple manipulation of rightward or leftward rotating the adjustment knob 17. Therefore, it is possible also to realize the manual binding tool A in which the tightening force of the binding tie B can be easily adjusted and set in accordance with the to-be-bound object K, and which is highly practically advantageous.

Description of Reference Numerals

[0090]

1	first lever
2	second lever
4	tie portion
4a	projection tie portion
4b	deformed portion
5	head portion
10	hole
a	tightening mechanism
b	tightening linkage mechanism
c	cutting mechanism
d	cutting linkage mechanism
e	switching mechanism
f	tightening adjusting mechanism
h	pushing mechanism
i	pulling portion
j	return preventing mechanism

Claims

1. A manual binding tool (A) used for a metal tie (B) having a tie portion (4) and a head portion (5) incorporated in the tie portion, wherein the tool has:

a tightening mechanism (a) which pulls a projection tie portion (4a) that projects through the head portion (5), with respect to the head portion;

a cutting mechanism (c) having a cutting blade (27), which cuts the projection tie portion (4a) in a place in the vicinity of the head portion (5) by means of the cutting blade;

a first lever (1) and second lever (2) which are pivotally coupled to each other and whose gripping manipulation can be performed;

a tightening linkage mechanism (b) which links the first lever (1) and the second lever (2) with the tightening mechanism (a) in a state where the projection tie portion (4a) is pulled by relatively approaching swinging in a range within a predetermined relative angle of the both levers; and

a cutting linkage mechanism (d) which links the first lever (1) and the second lever (2) with the cutting mechanism in a state where the projection tie portion (4a) is cut by relatively approaching swinging of the both levers beyond the predetermined relative angle, and

a switching mechanism (e) is disposed which, when a pulling force of the tightening mechanism (a) is smaller than a preset value, sets a tightening state where the tightening linkage mechanism (b) is caused to operate, and the cutting linkage mechanism (d) is caused not to operate, and, when the pulling force of the tightening mechanism (a) reaches the preset value, causes the tightening linkage mechanism (b) not to operate, and the cutting linkage mechanism (d) to operate,

wherein the cutting mechanism (c) includes a pushing mechanism (h) which pushes and deforms a tie portion located in the head portion (5), and which causes the deformed portion (4b) to be engaged into a hole (10) of the tie portion onto which the head portion is previously fitted, **characterized in that**, the switching mechanism (e) is configured so that, by simply performing the gripping manipulation of the first and second levers (1,2) by which the both levers (1, 2) are caused to swing while relatively approaching, the tightening state where only the tightening mechanism (a) is caused to operate can be shifted to a punch cutting state where only the pushing mechanism (h) and the cutting mechanism (c) are caused to operate, and

wherein the tool is configured in a state where, in accordance with movement in which the first lever (1) and the second lever (2) are relatively approaching swung by the tightening mechanism (a) from a waiting state where the both levers are mostly openly swung, the projection tie portion (4a) is gripped by a pulling portion (i) and then pulled by the pulling portion, by means of the tightening mechanism,

a return preventing mechanism (j) which, when the projection tie portion (4a) is not gripped by the pulling portion (i), blocks a return movement of the projection tie portion to the head portion (5) is disposed, and
the return preventing mechanism (j) includes a chuck claw (15) placed between the cutting blade (27) and the pulling portion (i) so as to act on the projection tie portion (4a).

2. The manual binding tool according to claim 1, wherein a tightening adjusting mechanism (f) which can change setting of a maximum value of a pulling force caused by the tightening mechanism (a)is disposed.

Patentansprüche

1. Ein manuelles Bindewerkzeug (A), das für eine Metallbindung (B) mit einem Bindeteil (4) und einem Kopfteil (5), der in dem Bindeteil integriert ist, verwendet wird, wobei das Werkzeug aufweist:

einen Spannmechanismus (a), der einen Vorsprungsbindeteil (4a), der durch den Kopfteil (5) vorsteht, in Bezug auf den Kopfteil zieht;
einen Schneidmechanismus (c) mit einem Schneidmesser (27), der den Vorsprungsbindeteil (4a) an einer Stelle in der Nähe des Kopfteils (5) mittels des Schneidmessers schneidet;
einen ersten Hebel (1) und einen zweiten Hebel (2), die schwenkbar miteinander gekoppelt sind und deren Greifmanipulation durchgeführt werden kann;
einen Spannverbindungsmechanismus (b), der den ersten Hebel (1) und den zweiten Hebel (2) mit dem Spannmechanismus (a) in einem Zustand verbindet, in dem der Vorsprungsbindeteil (4a) gezogen wird, durch relatives annäherndes Schwenken in einem Bereich innerhalb eines vorgegebenen relativen Winkels der beiden Hebel; und
einen Schneidverbindungsmechanismus (d), der den ersten Hebel (1) und den zweiten Hebel (2) mit dem Schneidmechanismus in einem Zustand verbindet, in dem der Vorsprungsbindeteil (4a) geschnitten wird, durch relatives annäherndes Schwenken der beiden Hebel über den vorgegebenen relativen Winkel hinaus, und
ein Schaltmechanismus (e) angeordnet ist, der, wenn eine Zugkraft des Spannmechanismus (a) kleiner als ein voreingestellter Wert ist, einen Spannzustand einstellt, in dem der Spannverbindungsmechanismus (b) zur Betätigung veranlasst wird und der Schneidverbindungsmechanismus (d) nicht zur Betätigung veranlasst wird, und, wenn die Zugkraft des Spannmechanismus (a) den voreingestellten Wert erreicht, veranlasst, dass der Spannverbindungsmechanismus (b) nicht betätigt wird und der Schneidverbindungsmechanismus (d) betätigt wird,
wobei der Schneidmechanismus (c) einen Drückmechanismus (h) umfasst, der einen in dem Kopfteil (5) befindlichen Bindeteil drückt und verformt und der veranlasst, dass der verformte Teil (4b) in einem Loch (10) des Bindeteils gehalten wird, auf dem der Kopfteil vorher angebracht wird, **dadurch gekennzeichnet, dass** der Schaltmechanismus (e) derart konfiguriert ist, dass durch einfaches Durchführen der Greifmanipulation der ersten und zweiten Hebel (1, 2), durch die die beiden Hebel (1, 2) zum Schwenken veranlasst werden, während sie sich relativ annähern, der Spannzustand, bei dem nur der Spannmechanismus (a) zur Betätigung veranlasst wird, zu einem Stanzschneidezustand geändert werden kann, bei dem nur der Drückmechanismus (h) und der Schneidmechanismus (c) zur Betätigung veranlasst werden, und
wobei das Werkzeug in einen Zustand konfiguriert ist, in dem, in Übereinstimmung mit einer Bewegung, bei der der erste Hebel (1) und der zweite Hebel (2) relativ annähernd geschwenkt werden durch den Spannmechanismus (a) aus einem Wartezustand, bei dem die beiden Hebel am meisten offen geschwenkt sind, der Vorsprungsbindeteil (4a) von einem Zugteil (i) gegriffen wird und dann durch den Zugteil gezogen wird, mittels des Spannmechanismus,
ein Rückstellverhinderungsmechanismus (j) vorgesehen ist, der, wenn der Vorsprungsbindeteil (4a) nicht von dem Zugteil (i) gegriffen wird, eine Rückbewegung des Vorsprungsbindeteils zu dem Kopfteil (5) verhindert, und
der Rückstellverhinderungsmechanismus (j) eine Spannbacke (15) umfasst, die zwischen dem Schneidmesser (27) und dem Zugteil (i) angeordnet ist, um auf den Vorsprungsbindeteil (4a) zu wirken.

2. Das manuelle Bindewerkzeug gemäß Anspruch 1, wobei ein Spannanpassungsmechanismus (f) vorgesehen ist, der eine Einstellung eines maximalen Werts einer Zugkraft ändern kann, die durch den Spannmechanismus (a) veranlasst wird.

Revendications

1. Outil d'attache manuel (A) utilisé pour un lien métallique (B) ayant une portion formant lien (4) et une portion formant tête (5) incorporée dans la portion formant lien, dans lequel l'outil comprend :

un mécanisme de tensionnement (a) qui tire une

portion de lien en projection (4a) qui se projette à travers la portion formant tête (5), par rapport à la portion formant tête ;

un mécanisme de coupe (c) ayant une lame de coupe (27), qui coupe la portion de lien en projection (4a) à un emplacement au voisinage de la portion formant tête (5) au moyen de la lame de coupe ;

un premier levier (1) et un second levier (2) qui sont couplés en pivotement l'un à l'autre et dont la manipulation peut être effectuée par agrippement ;

un mécanisme à tringlerie de tensionnement (b) qui relie le premier levier (1) et le second levier (2) avec le mécanisme de tensionnement (a) dans un état dans lequel la portion de lien en projection (4a) est tirée par approche relative en pivotement dans une plage à l'intérieur d'un angle relatif prédéterminé des deux leviers ; et

un mécanisme de tringlerie de coupe (d) qui relie le premier levier (1) et le second levier (2) avec le mécanisme de coupe dans un état dans lequel la portion de lien en projection (4a) est coupée par approche relative en pivotement des deux leviers au-delà de l'angle relatif prédéterminé, et

il est prévu un mécanisme de commutation (e) qui, lorsqu'une force de traction du mécanisme de tensionnement (a) est plus petite qu'une valeur préétablie, établit un état de tensionnement dans lequel le mécanisme de tringlerie de tensionnement (b) est amené à fonctionner, et le mécanisme de tringlerie de coupe (d) est amené à ne pas fonctionner et, quand la force de traction du mécanisme de tensionnement (a) atteint la valeur préétablie, amène le mécanisme de tringlerie de tensionnement (b) à ne pas fonctionner, et le mécanisme de tringlerie de coupe (d) à fonctionner,

dans lequel le mécanisme de coupe (c) inclut un mécanisme pousseur (h) qui pousse et qui déforme une portion de lien située dans la portion formant tête (5), et qui amène la portion déformée (4b) à s'engager dans un trou (10) de la portion de lien sur laquelle la portion formant tête est auparavant montée,

caractérisé en ce que le mécanisme de commutation (e) est configuré de telle façon que, en effectuant simplement la manipulation par agrippement du premier et du second levier (1, 2), par laquelle les deux leviers (1, 2) sont amenés à pivoter tout en s'approchant relativement, l'état de tensionnement selon lequel seul le mécanisme de tensionnement (a) est amené à fonctionner peut être commuté vers un état de coupe et de poinçonnement dans lequel seul le mécanisme pousseur (h) et le mécanisme de coupe (c) sont amenés à fonctionner, et

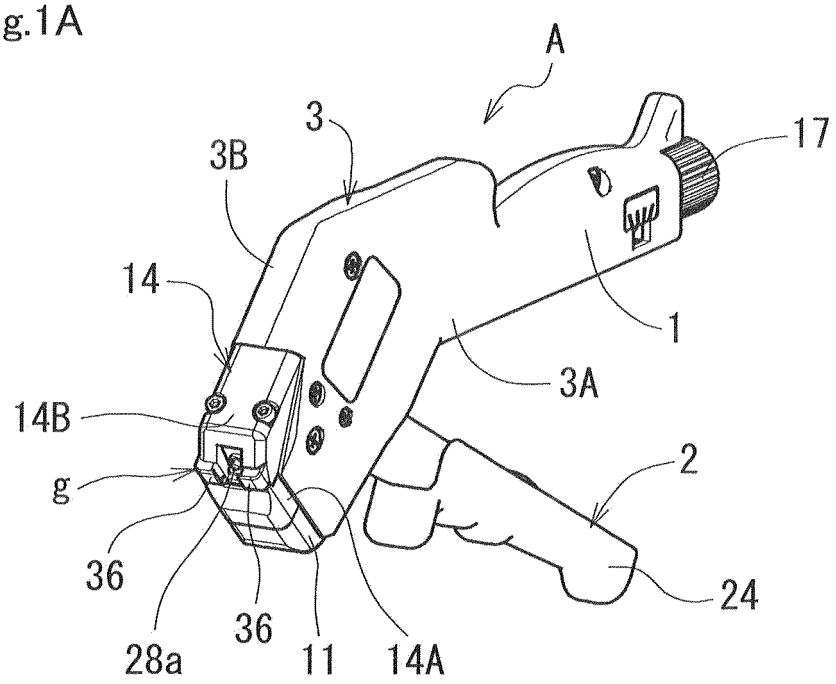
dans lequel l'outil est configuré dans un état dans lequel, en accord avec un mouvement dans lequel le premier levier (1) et le second levier (2) sont amenés à s'approcher relativement en pivotement par le mécanisme de tensionnement (a) depuis un état d'attente dans lequel les deux leviers sont en majeure partie pivotés en ouverture, la portion de lien en projection (4a) est agrippée par une portion de traction (i) et est alors tirée par la portion de traction, au moyen du mécanisme de tensionnement,

il est prévu un mécanisme d'empêchement de retour (j) qui, quand la portion de lien en projection (4a) n'est pas agrippée par la portion de traction (i), bloque un mouvement de retour de la portion de lien en projection vers la portion formant tête (5), et

le mécanisme d'empêchement de retour (j) inclut une mâchoire de bridage (15) placée entre la lame de coupe (27) et la portion de traction (i) de manière à agir sur la portion de lien en projection (4a).

2. Outil d'attache manuel selon la revendication 1, dans lequel il est prévu un mécanisme d'ajustement de tensionnement (f) qui peut changer le réglage d'une valeur maximum de la force de traction provoquée par le mécanisme de tensionnement (a).

Fig.1A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3A
14B
2
g
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24
36
28a
11
14A

Fig.1B

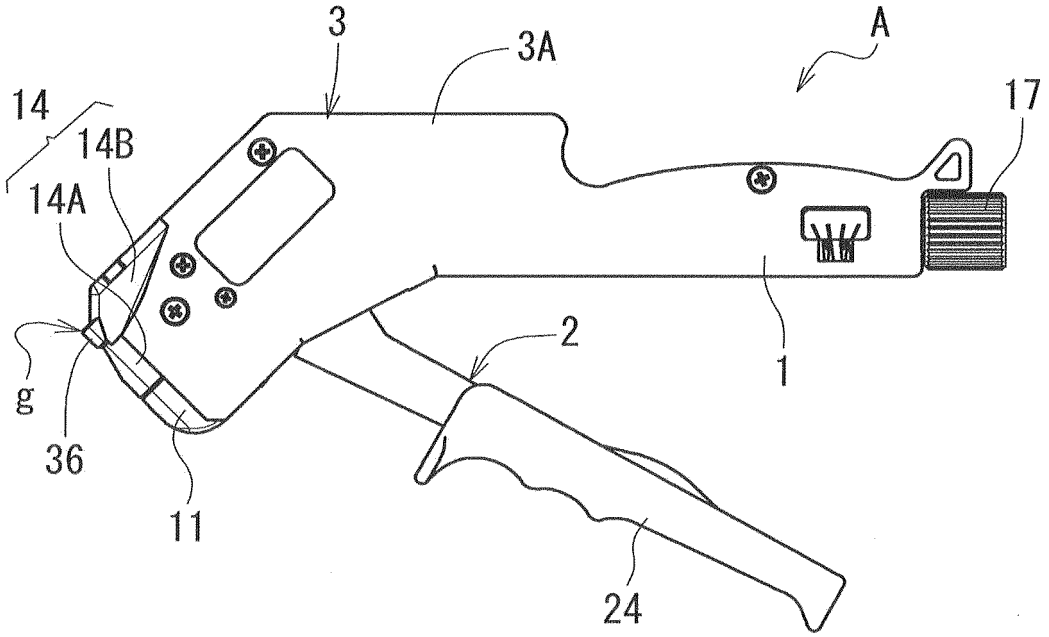
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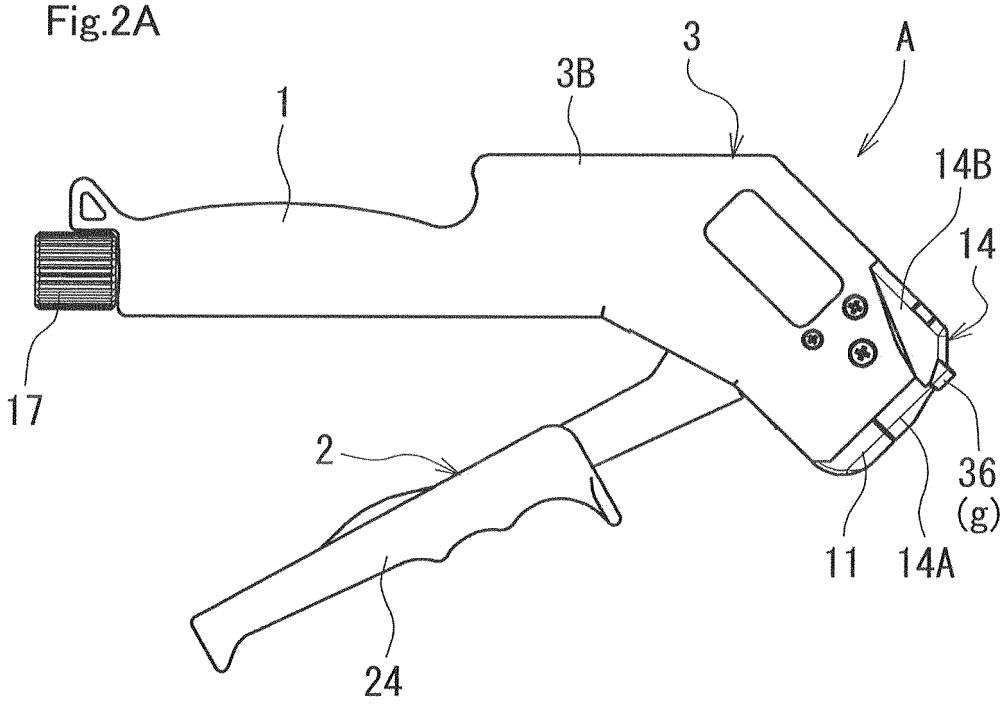
Fig.2A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A
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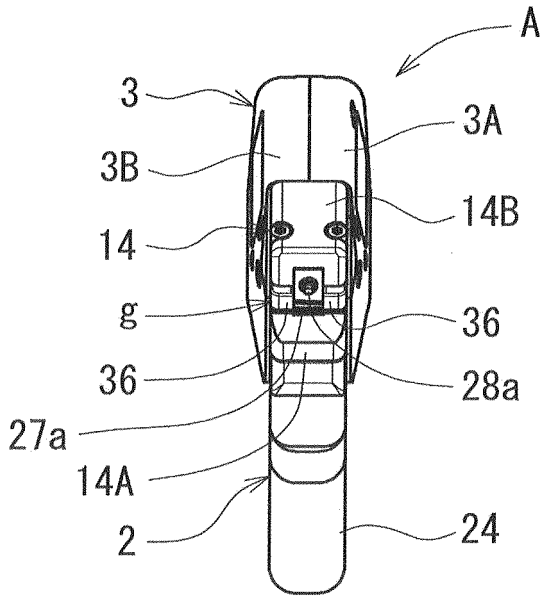
(g)
11
14A
24

Fig.2B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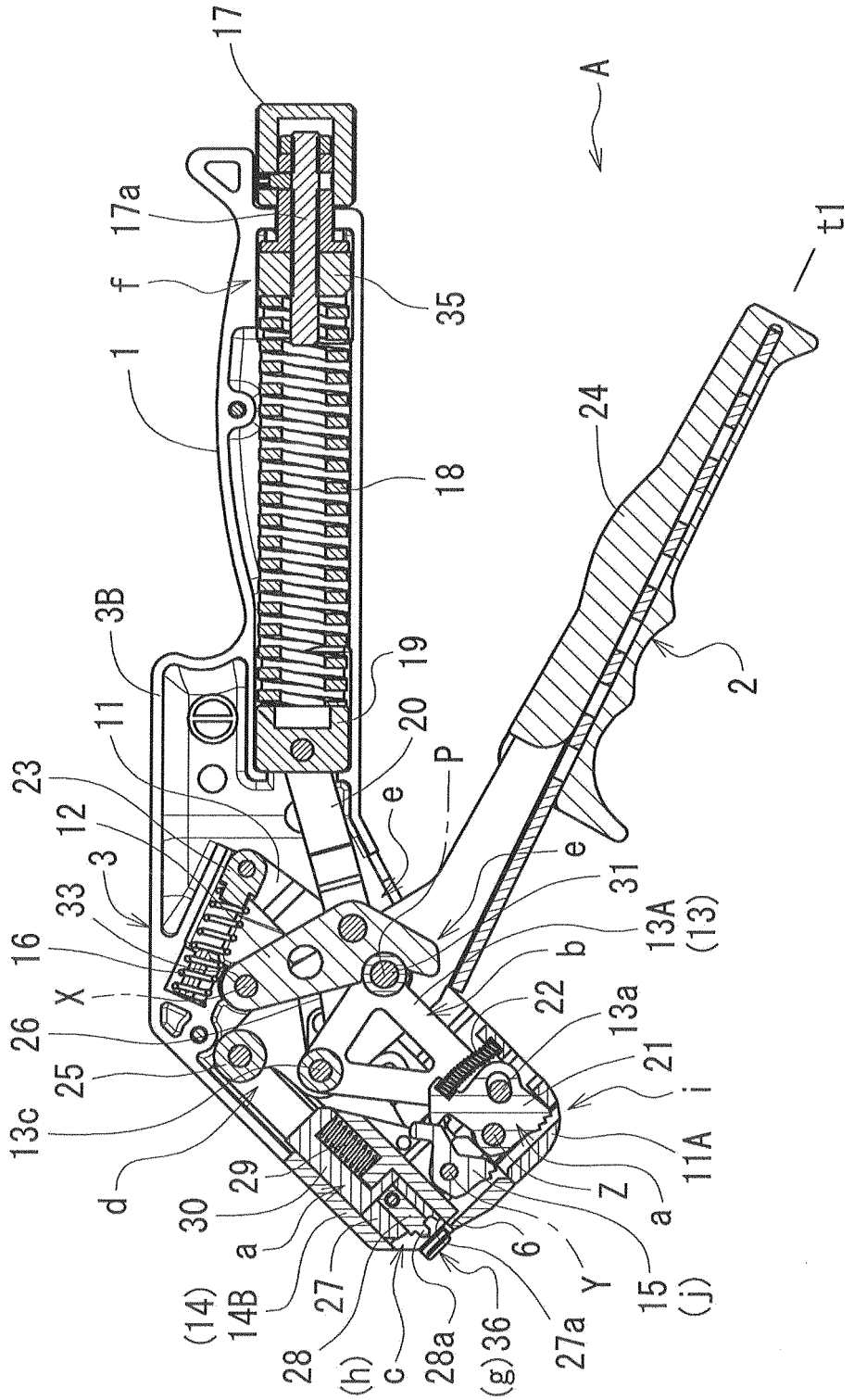
2
24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13A
(13)
16
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X
22
13a
26
21
25
i
13c
11A
d
29
Z
30
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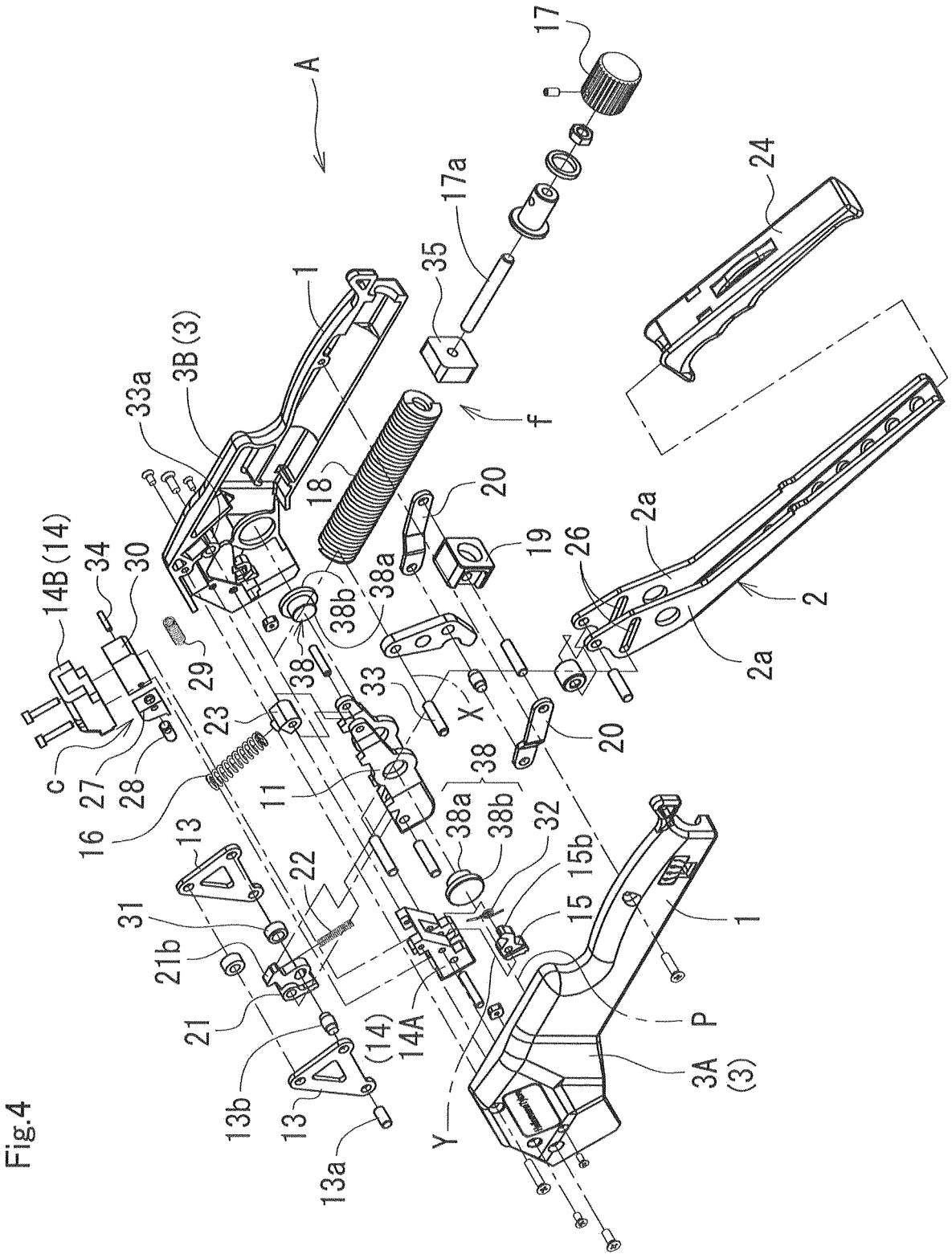
28
(h)
c
28a
(g) 36
27a

Fig.3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f
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2
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38a
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33
X
20
2a
c
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28
23
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38
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38b
32
13
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15b
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(3)

Fig.4

Fig.5A

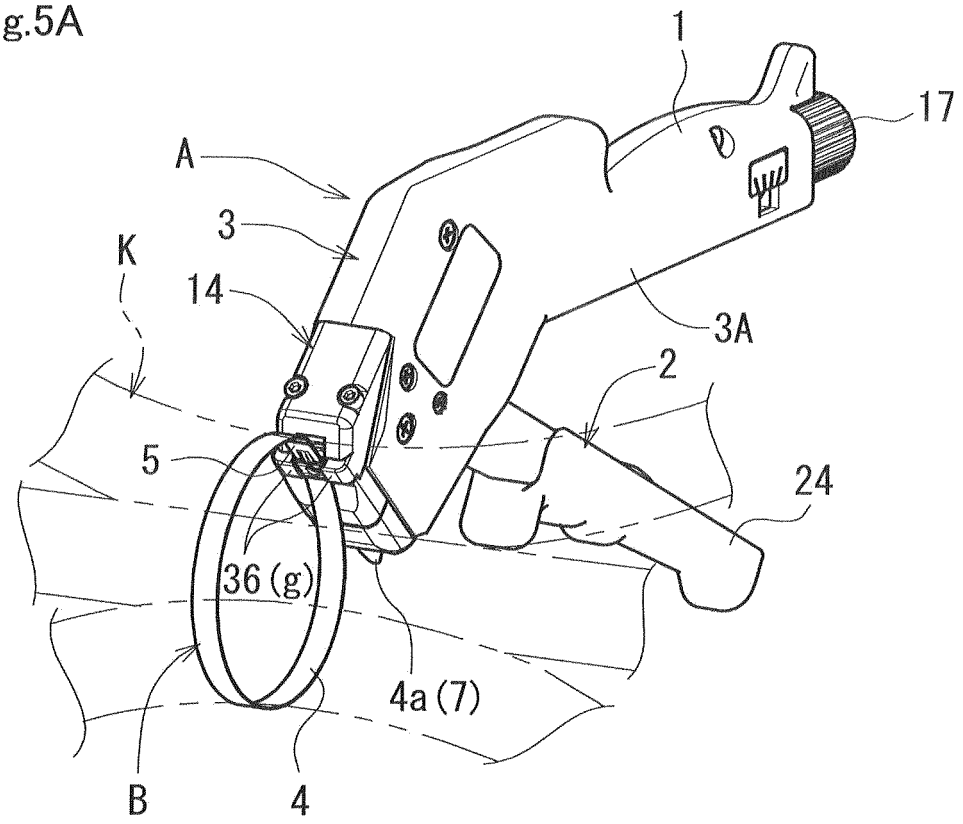


Fig.5B

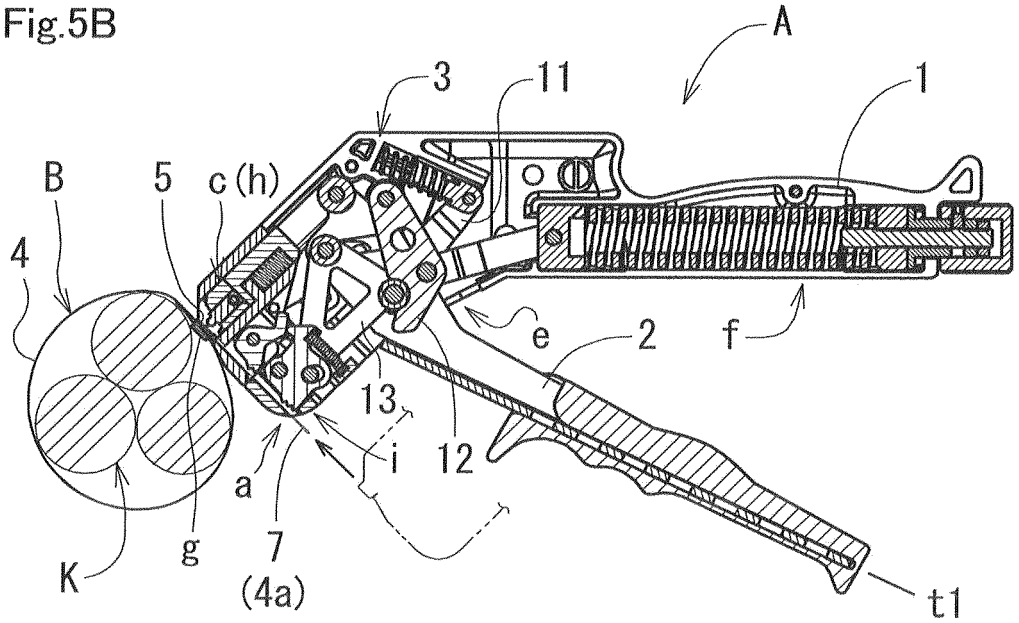


Fig.6A

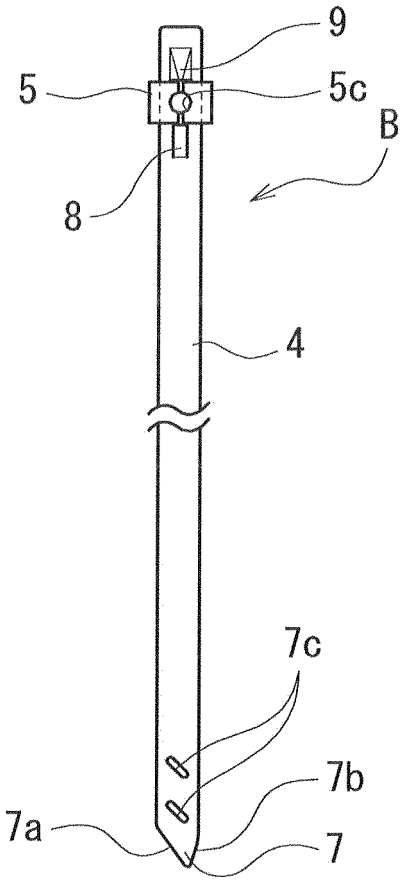


Fig.6B

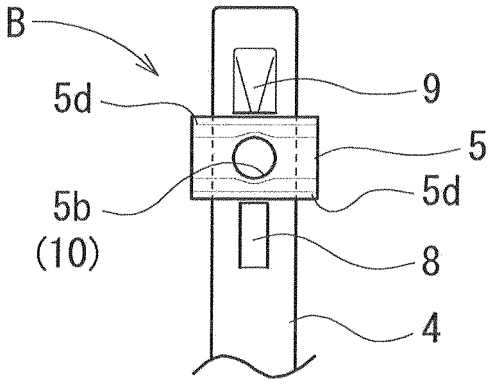


Fig.7A

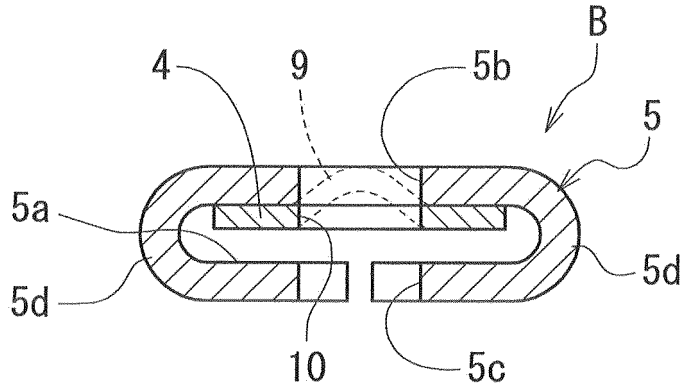


Fig.7B

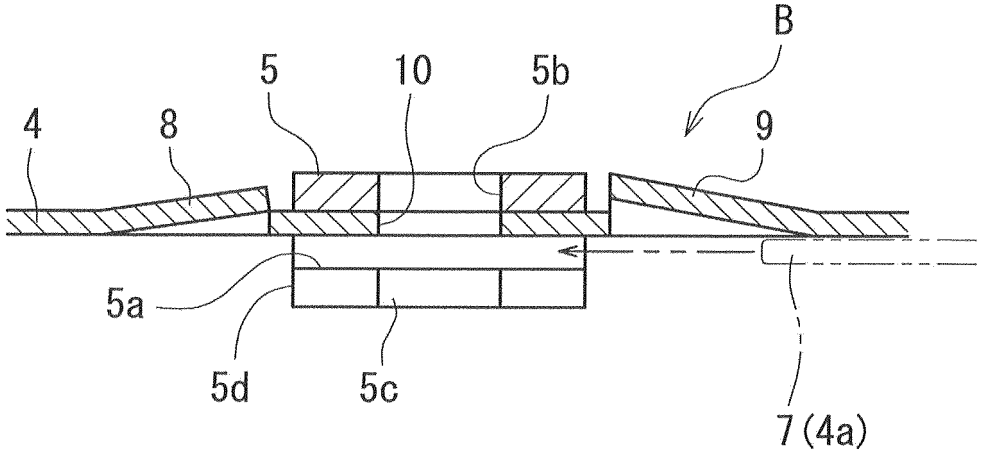
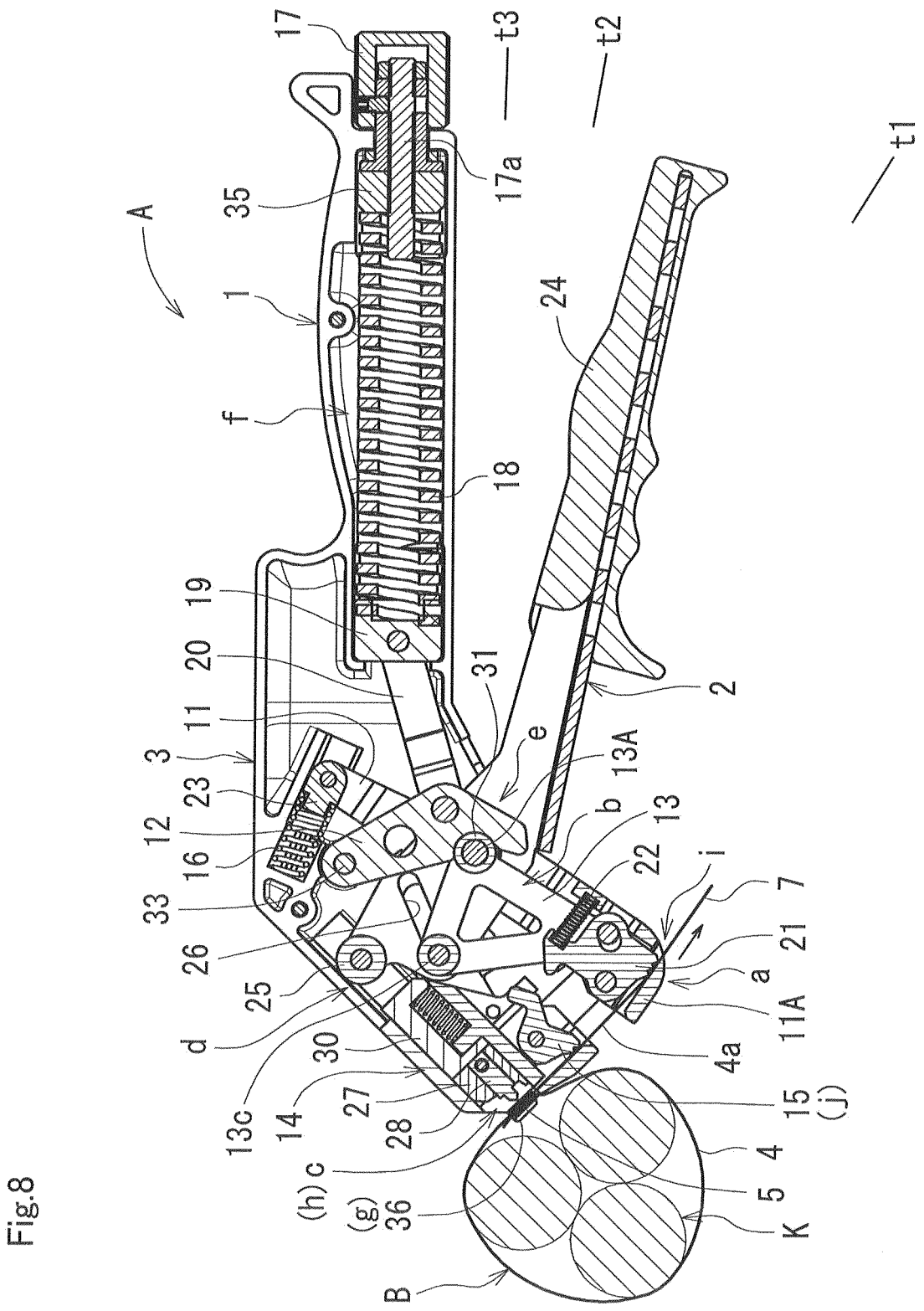


Fig.8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(j)
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4
(h) c
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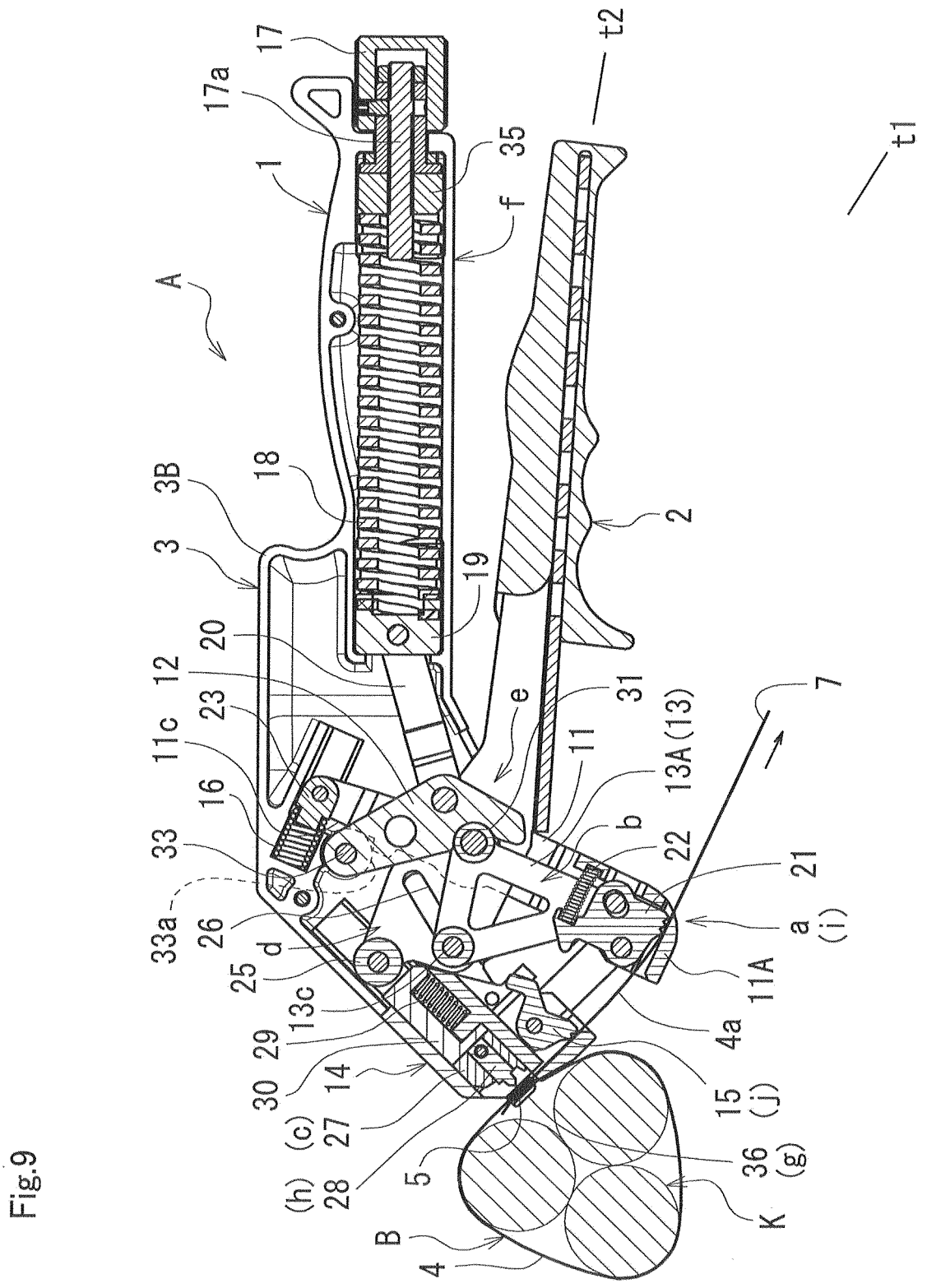
(g)
36
K
B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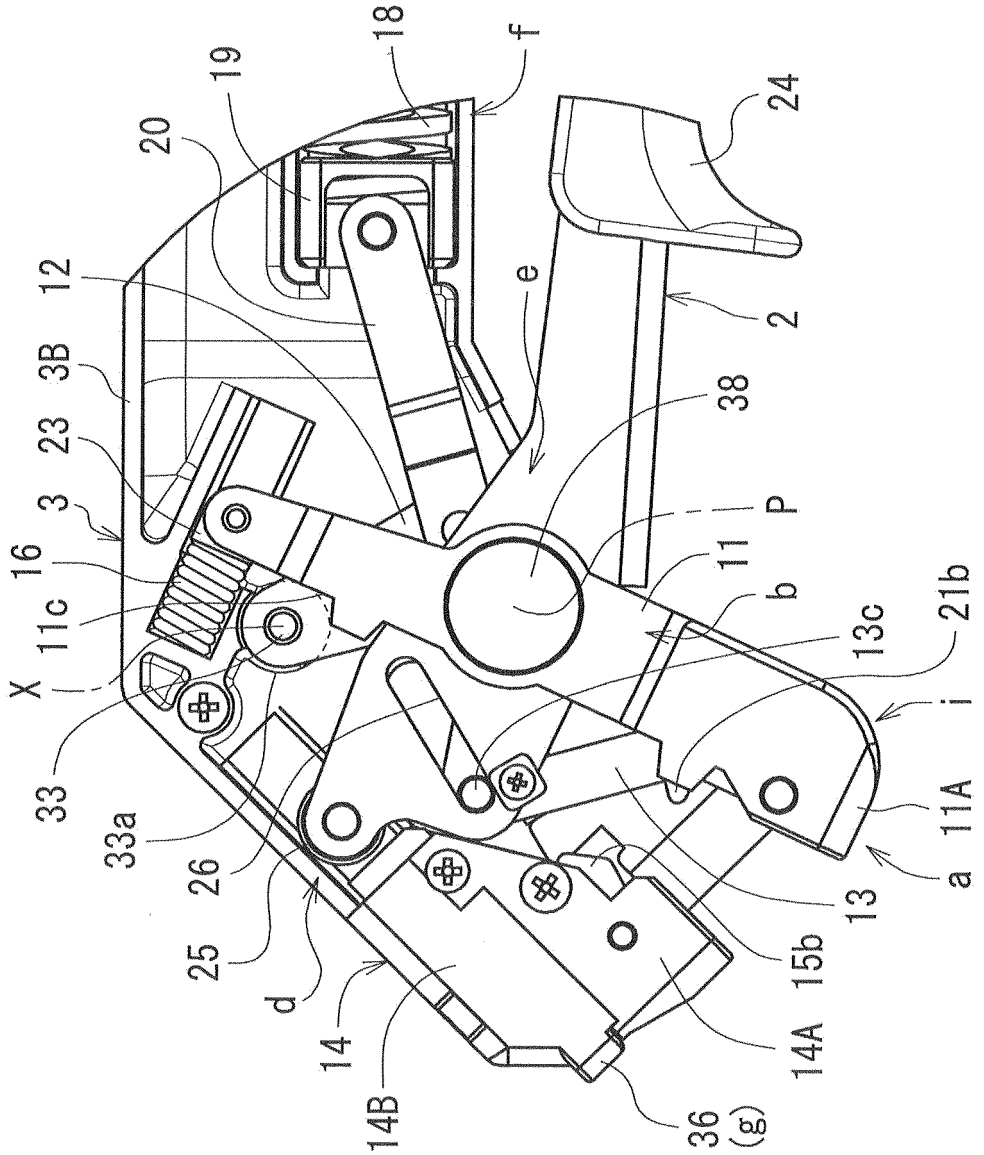
d
25
13c
29
30
(c)
27
14
(h)
28
5
B
4
f
35
t2
t1
2
19
e
31
11
13A(13)
7
b
22
21
a
(i)
11A
4a
15
(j)
36
(g)
K

Fig.9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19
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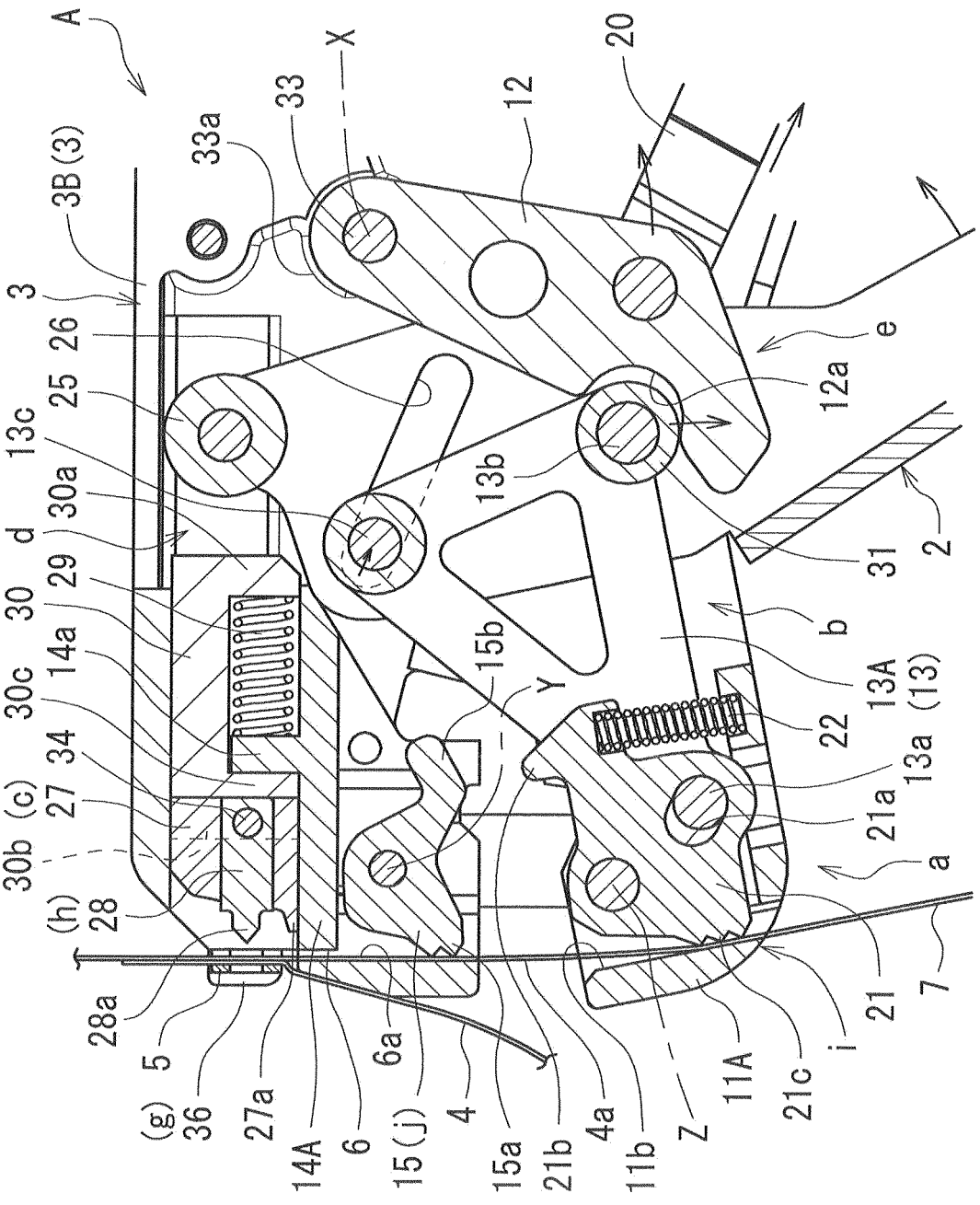
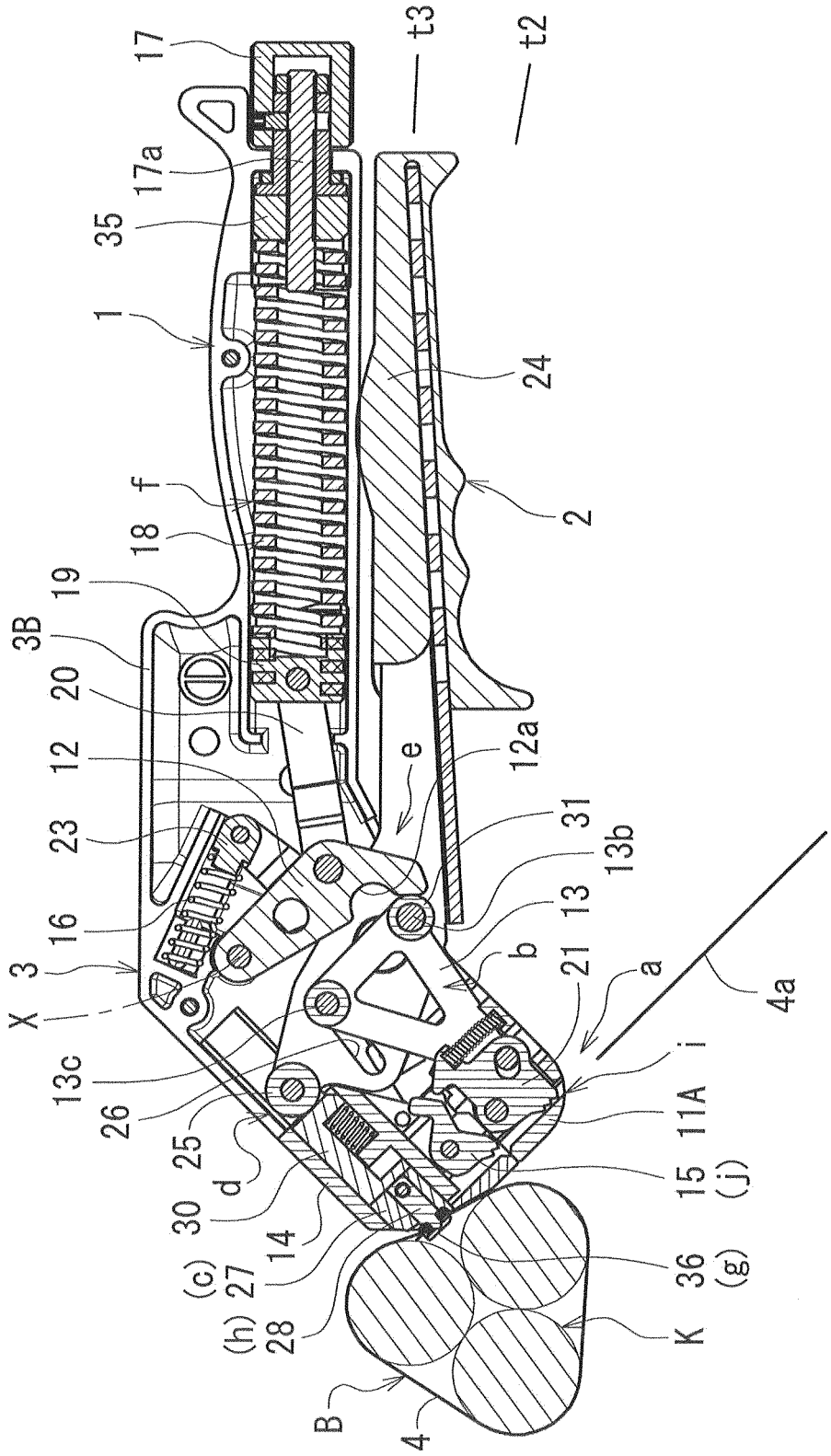
24
12
e
2
3B
38
23
P
3
11
16
b
11c
13c
21b
X
i
33
11A
33a
a
26
13
25
15b
d
14A
14
14B
36
(g)

Fig.10

Fig.11


A
3B (3)
3
33a
33
X
12
20
26
25
13c
30a
d
30
29
14a
30c
34
27
(c)
30b
(h)
28
28a
5
(g)
36
27a
14A
6
6a
15 (j)
4
15a
21b
4a
11b
Z
11A
21c
i
21
7
a
21a
13a (13)
13A
22
b
15b
Y
13b
12a
e
31
2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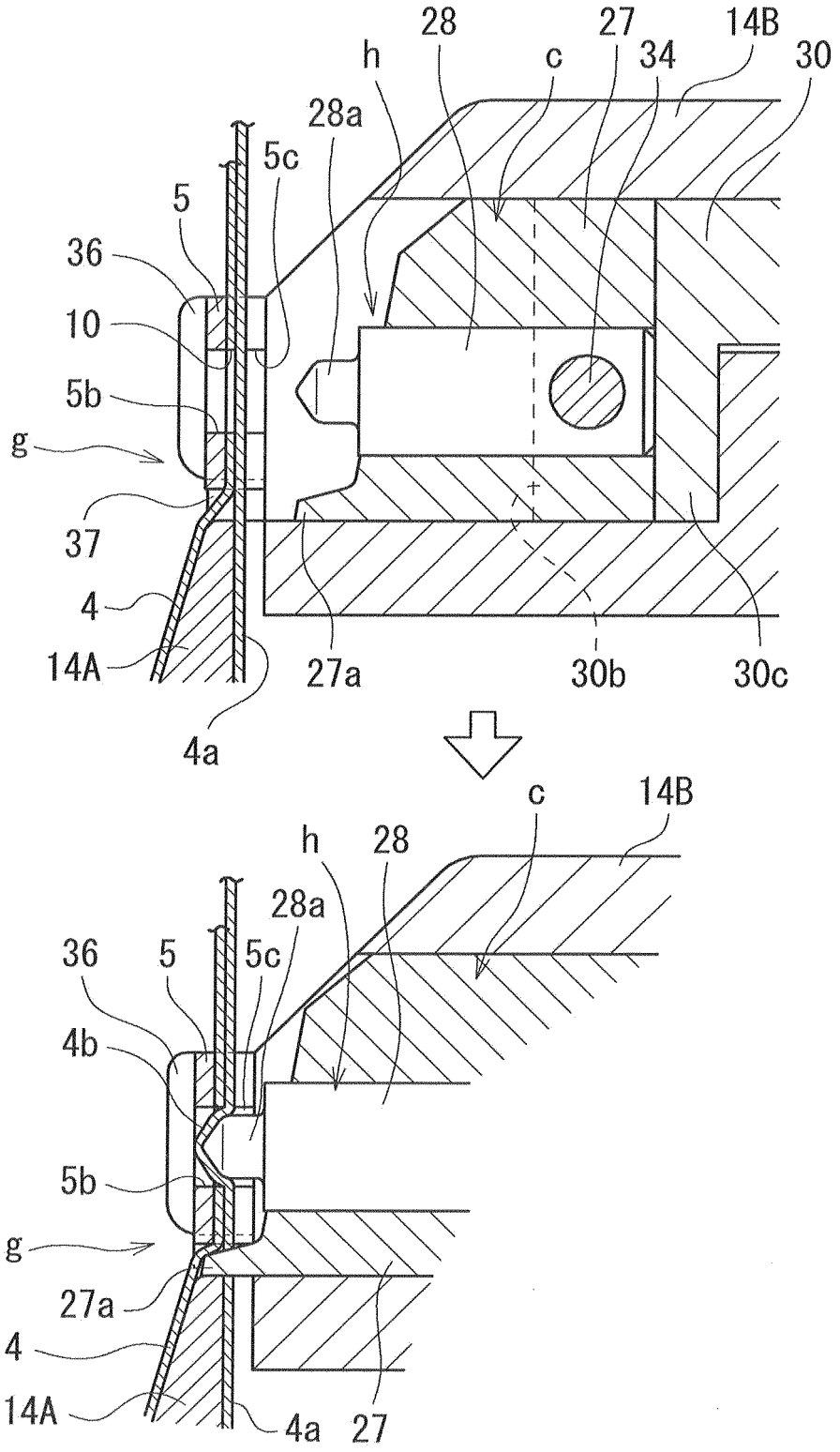
t3
t2
17a
35
1
24
f
2
18
19
3B
20
12
12a
e
23
31
13b
16
13
3
b
21
a
4a
X
i
13c
11A
26
25
15
(j)
d
30
(c)
14
36
(g)
27
(h)
28
K
B
4

Fig.12

Fig.13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27
14B
h
c
34
30
28a
5c
5
36
10
5b
g
37
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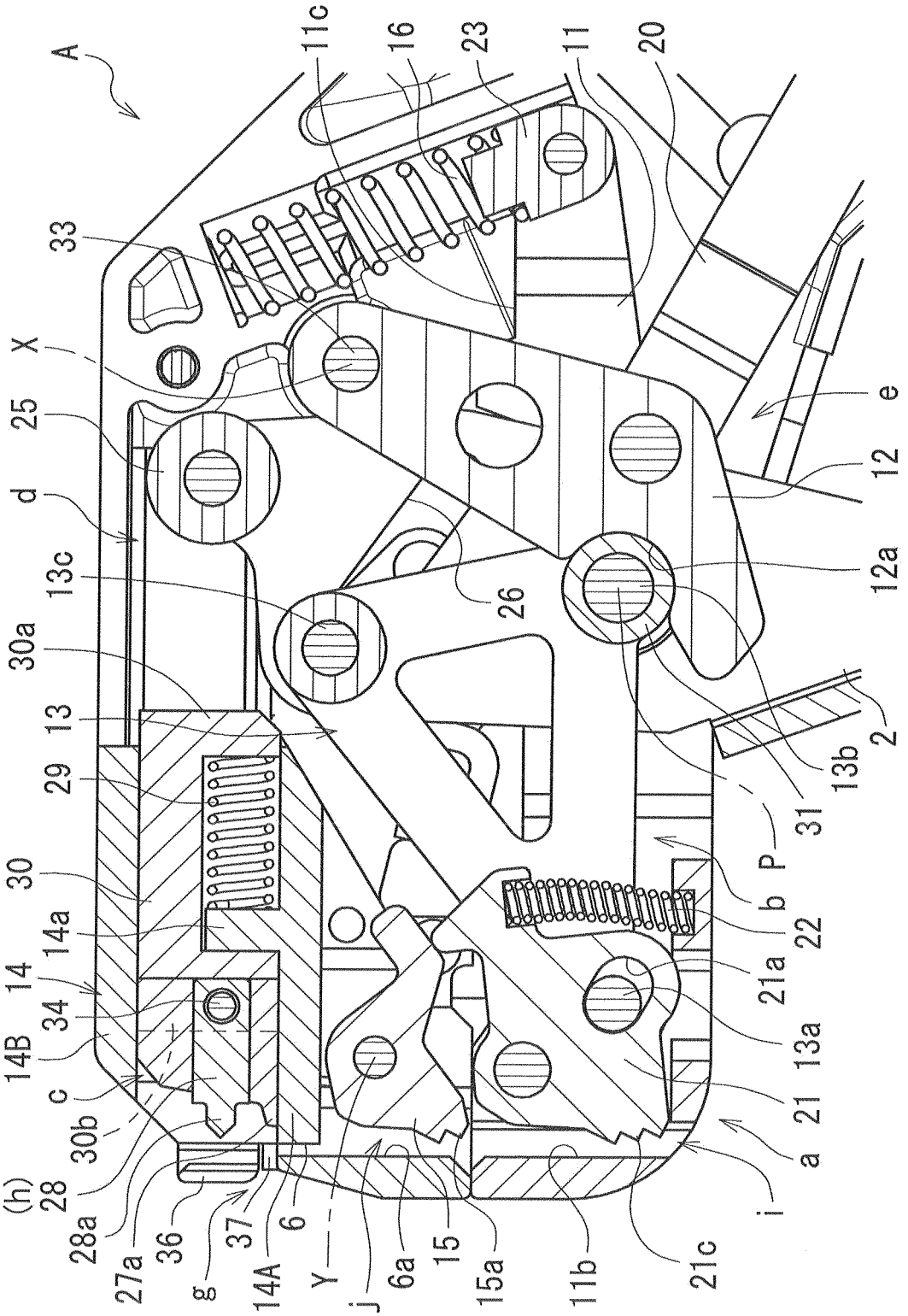
27a
30b
30c
c
14B
h
28
28a
36
5
5c
4b
5b
g
27a
4
14A
4a
27

Fig.14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16
23
11
20
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X
25
d
13c
30a
13
29
30
14a
14
34
14B
c
30b
(h)
28
28a
27a
36
g
37
14A
6
Y
j
6a
15
15a
11b
21c
i
a
21
13a
21a
22
b
P
31
13b
2
26
12a
12
e

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- JP 2009262965 A **[0005]**